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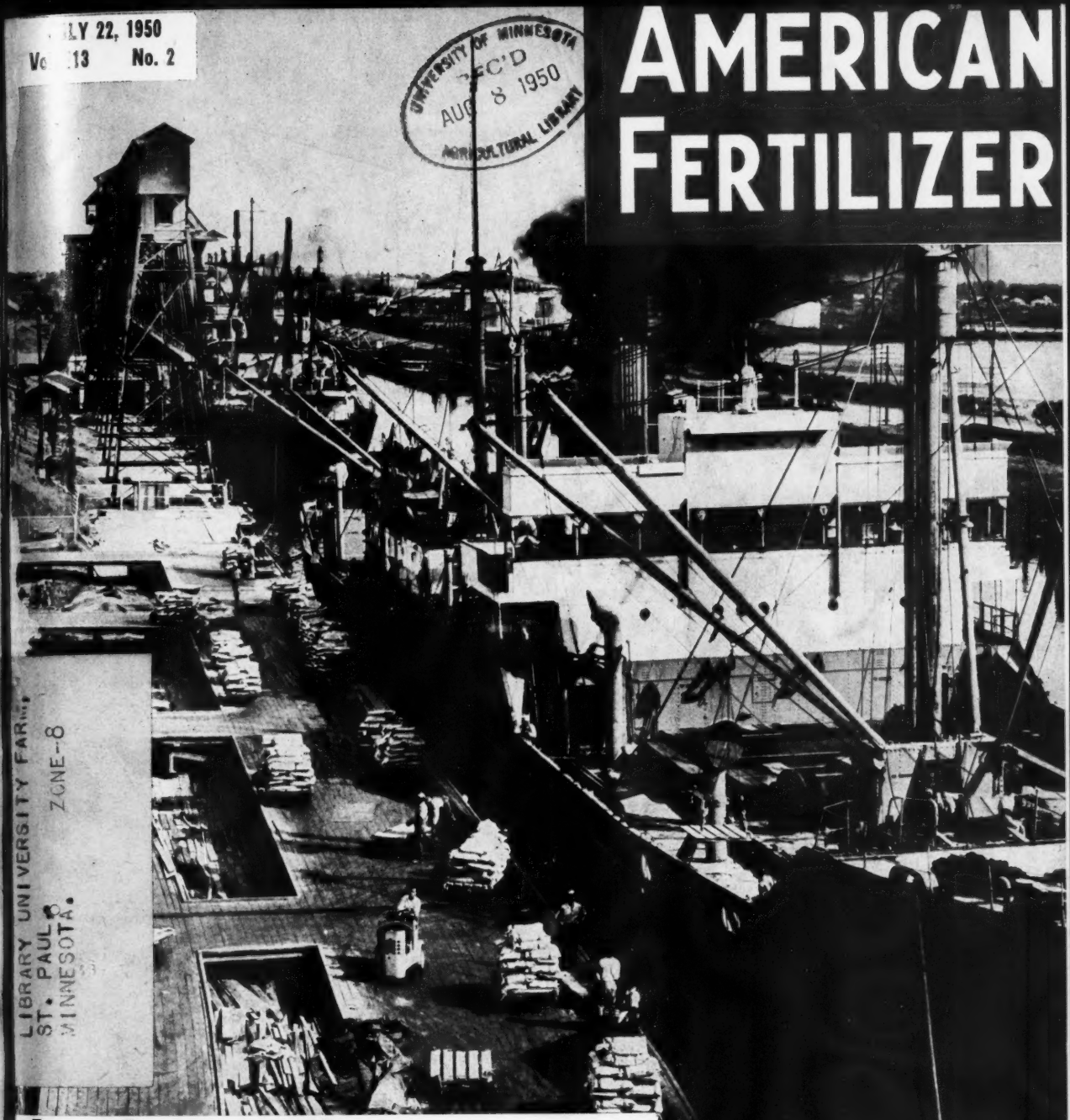

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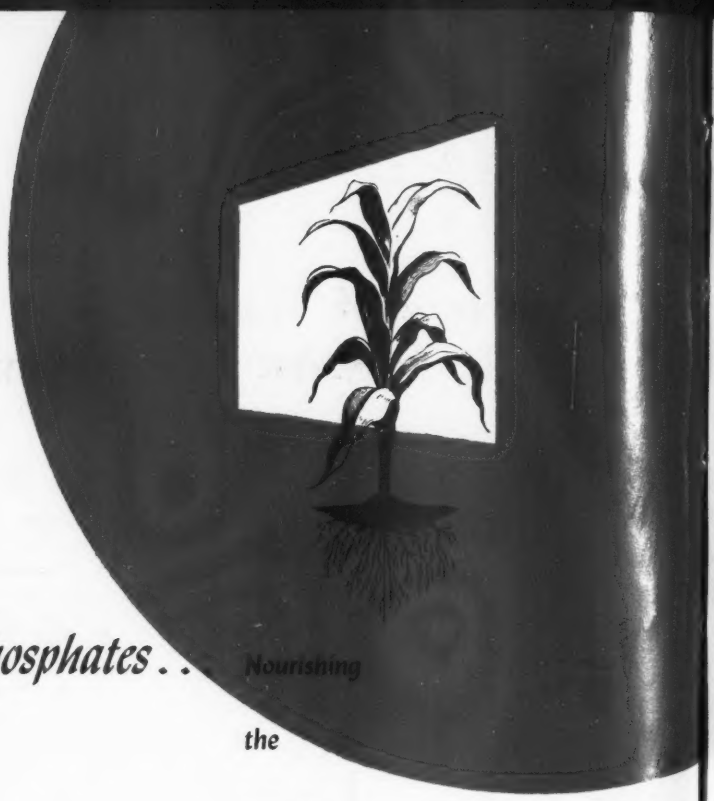

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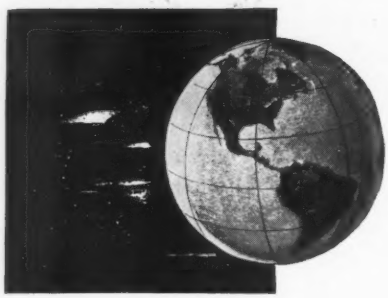

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AMERICAN FERTILIZER

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This week's cover shows the cooperation of the American railroads and our fertilizer industry . . . like ham and eggs, or "a" and "b" the Iron Horse and the plant food producers must go together to make a success . . . this photograph shows phosphate loading docks of the Atlantic Coast Line railroad at Port Tampa, Florida.

EDITORIAL

TODAY I WOULD like to "tip my battered old typewriter" to a fine gentleman who has meant much to the plant food industry.

"Judge" Murph, the tall fellow with the curl in his hair and the kindly twinkle in his bright eyes, is going out to the green pastures of retirement—where the days are long and memories can romp to the far horizons.

And what grand memories "Judge" can dwell upon as he looks ahead and back!

* * * *

We who are still fighting the daily production grind should take a bit of time to stop and think what men like "the Judge" have meant to our business. The fertilizer industry stands on the strong foundation built by the hard work of men like D. S. Murph. Men who realized long ago that this business we are in is vital to America . . . men who realized that plant food manufacturers are the natural leaders in any farm progress . . . men who, perhaps, took research and association jobs at less money for reasons that are sometimes hard for the average "money-men" to understand . . . men who took jobs and *did a job* which meant more to America than much of the business balderdash going on down through the years under the name of commerce.

* * * *

IN THE CAPACITY OF EDITOR of the pioneer magazine of the industry you meet 'em all.

But you only meet one "Judge."

There's a fine quality about D. S. Murph which defies accurate description in the cold black and white of printer's type. Let's just say, "He is a gentleman."

There are not many "gentlemen" left on this whirling ball of mud and rock we call Earth.

* * * *

"Judge" Murph and a small handful like him stood for the best in Big Business—and there is a "best" which is too often forgotten when Big Business is cussed and discussed in the employee's homes and the union offices. When the government cracked down on the fertilizer industry we were lucky to have some tall, solid timber which did not bend and break before the Congressional cyclone of mis-information.

* * * *

MAYBE THAT BIG WASHINGTON WIND put more curl in "Judge's" hair, but the final satisfactory results and the forward march of plant food progress since those days has made the smile lines deeper to match the twinkle.

* * * *

AMERICAN FERTILIZER has said before, "The fertilizer industry is the keystone in the arch of an agricultural bridge leading to a new and better world in which to live."

Today we are saying "Good Luck" to one of the bridge builders.

NEW INSECTICIDES:

The use of sprays brings new problems to fertilizer and insecticide manufacturers

NEW INSECTICIDES bring new problems. Not only must the new chemical be effective in combating insect pests, but it must also be reasonably safe for the spray operators to use, leave no residue on fruit and vegetables that is injurious to human health, cause no blemishes on the crop, break down rapidly enough so that no residue builds up in the soil, cause no off-flavor to the crop at harvest, and finally, be compatible with other agricultural chemicals.

Toxicity of insecticides to mankind is determined for the most part by analogy. Laboratory animals such as White rats, for instance, are fed on a diet of some foodstuff to which the insecticide has been added, to determine any chronic effects—those which appear only after a period of weeks. Such effects may exhibit themselves as damage to the liver, gall bladder, kidneys, or other vital organs.

Toxicity is also measured in terms of a mean lethal dose, i.e., that quantity required to kill 50 per cent of the animals under experimentation when fed by way of the mouth. This is expressed in terms of mg kilo; milligrams of the toxic agent per kilograms of body weight of the animals concerned.

Comparisons that certain of the new insecticides are more toxic or less so than DDT are based usually on the *acute oral toxicity.* For example, if the acute oral toxicity of DDT is the same for man as it is for rats (which may or may not be true), it would require ½ ounce of DDT to kill a man weighing approximately 150 pounds. The acute oral toxicity of DDT to white rats is 250 mg. per kilo. Assuming a ratio using DDT as a base level of 1, nicotine is rated as 25 times as toxic as DDT, parathion 70 times as toxic, and TEPP 125 times as toxic.

On the other hand, *Rhothane* (DDD or TDE) is said to be 1/10 as toxic to warm bloods as DDT, while methoxychlor, another close relative, is rated as 1/24 as toxic as DDT. While our investigations in the Pacific Northwest generally show that *Rhothane* and methoxychlor are less toxic to some insects, the difference is not as great as the figures quoted might indicate. In fact, with individual species of insects, *Rhothane* may be fully as effective as DDT at the same concentration.

Tolerances: While the federal Food and Drug Administration has ample authority to seize any fruits or vegetables where toxic residues are detected, it is realized that insecticides are necessary to protect those crops. In order to protect the public health on the one hand and the fruit grower on the other, the following tolerances have been established on apples and pears over a period of years:

Arsenic.....	0.025 grain per pound
Lead.....	0.05 grain per pound
Fluorine.....	0.05 grain per pound
DDT.....	0.05 grain per pound

The tolerance on fluorine was first set at 0.02 grain per pound in 1938 on fruit shipped within the jurisdiction of the federal Food and Drug Act. Later this was changed to 0.05 grain per pound. More recently this tolerance was declared invalid in a federal court in California on the ground that fluorine was a gas and thus there could be no residue involved. This court decision renders tolerances on lead and arsenic untenable, because neither arsenic nor lead is present on fruit as such, but comes in combination as lead arsenate. Consequently, such tolerances are regarded as informal tolerances. Legal tolerances may be established only through the mechanism of public hearings, according to the U. S. Food and Drug Administration.

Before setting legal tolerances, evidence must be presented (1) on the necessity for using added substances for controlling the enemies which interfere with the production of fresh fruits and vegetables, (2) as to whether the substances required for the production of fresh fruits and vegetables are poisonous or deleterious, and (3) on the amounts of these substances which are poisonous or deleterious which are received from all sources by consumers.

DDT: First synthesized in 1874

by a German chemist named Zeidler, DDT was patented as an insecticide in 1939 by Geigy, Inc., a Swiss concern. DDT is an abbreviation of the chemical term dichlorodiphenyl-trichlorethane. There are many trade names.

In recognition of the importance of DDT in the field of preventive medicine, Dr. Paul H. Mueller was formally awarded the Nobel prize in physiology and medicine in ceremonies held in Stockholm, Sweden, December 10, 1948. Dr. Mueller has been associated with the J. R. Geigy firm at Basle, Switzerland, since 1925. DDT had unprecedented development as a synthetic insecticide because of its unusual properties of wide range of insecticidal action, simple structure promoting ready synthesis, stability to light and air resulting in enduring

Their Use and Hazards to Human Health

By R. L. Webster*

residual toxicity and low mammalian toxicity, according to Robert L. Metcalf.

Technical DDT is a white to cream colored amorphous waxy powder produced by the reaction of chloral with mono-chlorobenzene in the presence of concentrated sulfuric acid. While the technical material has a variable composition, it is composed, for the most part, of two isomers. Of these the para-para isomer is far more toxic to insects than the ortho-para isomer. Commercial DDT may contain from 65 per cent to 85 per cent of the para-para isomer; 15 per cent to 21 per cent of the ortho-para isomer.

Effective Control

Where DDT is an effective control for specific insects, the para-para content of the commercial product has generally been sufficient, except where resistance has been developed after several years' use, as in the case of house flies and mosquitoes. The melting point of the para-para isomer is given as 108–109° C., that of the ortho-para isomer, 73–74° C. That of the technical product is usually given as 89°.

During the war years, DDT was used on a large scale for mosquito control in army camps, to combat flies and bedbugs, and to impregnate clothing for body lice. Early reports from Switzerland indicated the value of the new insecticide for codling moth control.

For use as a liquid spray on fruit trees and vegetable crops, DDT is formulated as a wettable powder containing 50 per cent of the active ingredient. For dusting row crops DDT is ordinarily applied in a formulation containing five per cent of the active ingredient. *Attaclay*, an aluminum magnesium silicate, is quite generally used in 50 per cent DDT concentrates; talc in most of the low concentration dusts.

Approximately 2½ million pounds of 50 per cent wettable DDT were used on orchard crops in the state of Washington in 1949. This replaced some 15 million pounds of lead arsenate and cryolite previously used on tree fruits.

DDT has now replaced the rotenone dust formerly used for pea weevil control on dry edible peas in the Palouse country, and on green peas grown for processing in the Blue Mountain area. On the Washington potato crop, grown mostly in Yakima, Kittitas, Whatcom and Skagit counties, DDT is now used for flea beetle and aphis control, replacing the calcium arsenate cryolite and rotenone formerly applied.

All told, in terms of 50 per cent wettable DDT, Washington state uses close to four million pounds of this insecticide annually. Approximately 35 million pounds of technical DDT were produced in the United States in 1948.

Effects on Mankind

Reports on DDT poisoning to man seem to be confined to men working at the spray tank, handling the insecticide in the form of a 50 per cent wettable powder. Apparently, the bronchial tubes are affected, resulting in a persistent cough which ordinarily will disappear in three week's time. This may not be due to the technical DDT, but to auxiliary materials used in the formulations.

Exposure to DDT does not result in any skin irritation, except in case of large quantities, according to Arnold J. Lehman, U. S. Food and Drug Administration. "Solutions of DDT, however, are absorbed and multiple exposures to solutions representing nine grams of DDT, spilled on the skin or clothing, may represent a quantity dangerous to man."

Quoting Lehman, symptoms of poisoning in experimental animals "usually begin as tremors of the muscles of the head and neck. The tremors progress caudally and increase in intensity with time so that eventually purposeful movements are difficult or cannot be accomplished. Frequent episodes of tonic and clonic convulsive seizures manifest themselves. These convulsive seizures occur with increasing frequency, becoming almost continuous. A stage of depression is eventually reached, terminating in respiratory failure and death. An uncomplicated case of poisoning in man has not been

Grasshoppers did this to Montana corn. Ag chemicals is the answer to the "bug battle"

*Entomologist and Chairman of Division of Entomology, Washington Agricultural Experiment Stations, The State College of Washington, Pullman.

reported, but from the meager information available it appears that giddiness, nervous tension and involuntary muscular tremors are some of the symptoms."

Most of the 50 per cent wettable powders are formulated with some clay in a finely divided form as a diluent. Consequently, a 50 per cent wettable powder may contain nearly one-half aluminum silicate.

Toxicologists report little or no effect of DDT in dermal applications or on the respiratory organs. According to the Washington State Department of Health, it is very unlikely that a man working at the mixing tank will get a fibrotic condition of the lungs (silicosis) due to the short period of exposure and the composition of the carriers and diluents.

Early in 1949, sensational articles written for New York papers inferred that millions of people were being slowly poisoned by the widespread use of DDT. Following a meeting in Washington, D. C., attended by a hundred representatives of various government agencies, a statement on the DDT hazard to human health was issued under date of April 1, 1949. The paragraphs quoted herewith are from this statement.

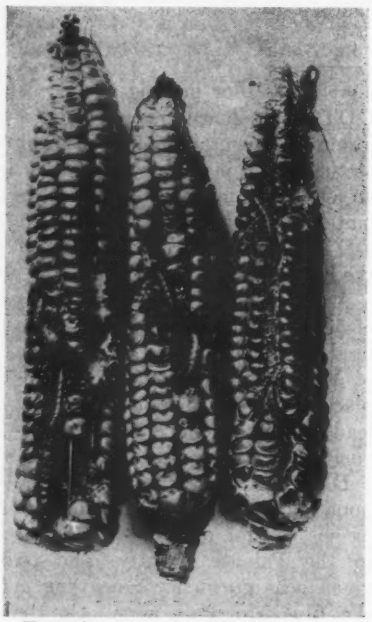
DDT is a very valuable insecticide which has contributed materially to the general welfare of the world. It has been used with marked success in both the control and prevention of such insect-borne diseases as malaria and typhus, and of insects which are destructive to crops and injurious to livestock and infest homes.

It is well recognized that DDT, like other insecticides, is a poison. This fact has been given full consideration in making recommendations for its use. There is no evidence that the use of DDT in accordance with recommendations of the various federal agencies has ever caused human sickness due to the DDT itself. This is despite the fact that thousands of tons have been used annually for the past four or five years, in the home and for crop and animal protection. However, minor toxic symptoms may be produced by kerosene and various solvents used in DDT and practically all other insecticidal mixtures.

Statements that DDT is responsible for causing the so-called "virus X disease" of man and "X disease" of cattle are totally without foundation. Both of these diseases were recognized before the utilization of DDT as an insecticide.

Effect on Wildlife

During 1947 and 1948 many dead game birds were found in eastern Washington orchards. At first it was thought that these birds had been killed when heavy concentrations of TEPP had been applied to control mites, either by the use of fog machines or by airplane. Using



Toxaphene and chlordane are some of the answers to the European corn borer . . . shown here hard at work

mist sprays at concentrations ten times those normally applied in orchard practice, Dr. E. H. Peterson, Associate Veterinarian, State College of Washington, was unable to kill young chickens or nearly mature Chinese pheasants in the laboratory. Likewise, Ralph W. Mohr, State Department of Game, has exposed caged pheasants in orchards where TEPP was being applied with a fog machine, without killing the birds.

Because of so many reports of dead game birds found in orchards, the Washington State Department of Game assigned Mr. Mohr, one of their game biologists, to look for dead game birds in orchards and to find out the spray schedules in those orchards where these were observed. During these two years, some 750 cases of dead game birds and song birds were studied. At the present time the evidence points to chronic DDT poisoning, rather than to other new insecticides employed in Washington orchards. Of the song birds, robins were particularly susceptible to orchard sprays.

In north Idaho in 1947, some 400,000 acres of forest lands were sprayed with DDT to combat an outbreak of the tussock moth. This effort was rated as entirely successful, since at the end of the season practically all tussock moth caterpillars in the treated area had been killed. Applications were made as a liquid spray by airplane. Technical DDT, one pound, was used in a solvent with a light fuel oil to make one gallon of spray.

Used at the rate of one pound technical DDT per acre, no ill effects were observed in wild or domestic animals. Rainbow, eastern brook, and cutthroat trout in the 40 streams in the treated area suffered no apparent ill effects. On the other hand, insect larvae were practically eliminated from streams in the area, and an examination of trout stomachs indicated a 50 per cent reduction in available food and a change in diet to include more crustacean forms. Crayfish mortality in sprayed streams was heavy.

Effect on Honey Bees

Beekeepers in the lower Yakima Valley were much concerned when potato growers went over to the use of DDT on a large scale to control flea beetles and aphids. Previously the bee men had suffered heavy losses in this area when calcium arsenate dusts had been used. Although DDT is definitely toxic to honey bees, the general use of this insecticide on potatoes did not serve to aggravate the problem of bee poisoning. As a matter of fact, less poisoning occurred when DDT was used than before.

Two reasons may be given for this condition of affairs: (1) DDT as applied is less toxic to honey bees than calcium arsenate, and (2) beekeepers have learned to meet the problem by moving yards to new locations at the first sign of poisoning.

Application of a 10 per cent DDT dust, 20 pounds to an acre, has actually increased alfalfa seed production, in spite of the fact that

(Continued on page 17)

Letter from London

MICRONUTRIENT DEFICIENCIES IN CROPS*

By Dr. E. J. Hewitt

It is well known that several disorders of crop plants in the field can be traced to the deficiency or excess of a mineral element. These effects are frequently striking in appearance and economically important and many are due to lack of one of the mineral elements required by plants in only minute amounts—the micronutrient elements.

The occurrence of these deficiency effects naturally in the field is not always due to actual lack of the element concerned but to the interaction of other factors leading to unavailability. In culture experiments, however, such problems of availability do not usually occur and special techniques may be necessary to reproduce effects of soil deficiencies as the absolute amounts needed are so minute. Examples of the concentrations in culture solutions and in plants (dry material) associated with deficiency and normal development are approximately as follows:

Element	Concentration in Plant	In Solution
Manganese and Boron.....	Deficiency 5–20 p.p.m.	.01 p.p.m.
	Normal 30–150 p.p.m.	.5 p.p.m.
Copper and Zinc.....	Deficiency 1–5 p.p.m	.002 p.p.m.
	Normal 5–15 p.p.m.	.05 p.p.m.
Molybdenum.	Deficiency 0.02–0.2 p.p.m.	.00002 p.p.m.
	Normal .5–5 p.p.m.	.02 p.p.m.

Culture Technique

There are two main culture techniques suitable for the production of deficiency effects. Namely, water culture and sand culture. The former requires less equipment but is associated with certain limitations including the need for forced aeration, liability to chlorosis, unsuitability to certain crops, e. g., potato. Sand culture methods are easier to manage, produce vigorous growth with all crops and are free from problems of chlorosis and aeration but the sand itself is a possible source of micronutrient contamination and its purification imposes an extra burden. In spite of this, however, severe effects due to deficiencies of several micronutrients can be produced in sand cultures when suitable methods are employed.

At Long Ashton a technique has been developed to enable such work to be carried out on a large scale and when necessary to fulfill the exacting requirements needed to produce severe micronutrient deficiency effects.

The basic materials comprise the containers, sand, water, nutrient reagents and the seed or stock. For experiments lasting only a few months bitumen painted clay pots are suitable containers for iron manganese and boron deficiencies, but for omission of zinc, copper or molybdenum, pyrex glass vessels are necessary. In any case free drainage is essential and the sand is retained by a watch glass and glass wool. All the glassware can be cleaned in hot acid and steam.

The sand is purified by an acid extraction of the sifted sand. The coarser fraction retained on the sieve is relatively rich in many micronutrients which are concentrated in fragments of ferric oxide by the sand. The acid mixture consists of 15 per cent hydrochloric and 1 per cent oxalic acids and the sand is heated and circulated automatically for several hours in a specially designed acid proof apparatus. Batches of 250 pounds sand are treated at one time. The acid extracted sand is leached exhaustively in glazed vats or in the glass vessels, with water and with appropriately purified nutrient salts to remove the impurities in solution and to displace absorbed hydrogen ions. Where necessary it is tested before use, for example for freedom from molybdenum, by adding a sample of 2–5 g. to a culture flask inoculated with Aspergillus niger in a purified basal nutrient deficient in the element under test. The dry weight of mycelium produced under standard conditions is related to the available micronutrient impurity in the sand. Unpurified sand may contain 0.001 p.p.m. Mo and after purification this is less than 0.00002 p.p.m. In spite of the low initial level, further purification is very necessary. The present equipment will permit the preparation yearly of several tons of such highly purified sand.

The water supply is a matter of great importance and the consumption is high. One thousand cultures maintained each year consume 12–20,000 gallons of water. The great amount of water transpired means that only very low contamination can be tolerated. Rain water collected from the glass roof of the culture house is satisfactory for many purposes but for micronutrient deficiencies it has to be further purified. This is conveniently done by passing the water (elevated to a suitable level by pumps if necessary) through small Permutit synthetic resin ion exchange units. Here an exchange reaction of high efficiency results in the removal of 90–99 per cent or more of the mineral impurities. The treated water is substantially free of iron, manganese, boron and compares favourably with laboratory distilled water with respect to copper, zinc and molybdenum. Several thousand gallons of this water can be obtained each season without distillation. Resins now under investigation appear capable of removing added molybdenum with an efficiency exceeding 99.9 per cent and water entirely comparable to glass distilled water can be obtained with a molybdenum content of 0.000003 p.p.m. or less. Water supplies are tested by chemical means, but molybdenum content and efficiency of its removal by the resins is tested more reliably by the A. niger technique which has an absolute sensitivity of $10F^{-4}$ Ug. Mo. At present water used for molybdenum deficiency and copper and zinc deficiencies is produced from glass stills but it may be confidently anticipated that ion exchange purification will prove satisfactory in many instances where these elements are omitted.

The principal nutrient reagents are often important sources of specific micronutrient contamination, especially phosphates, calcium nitrate and magnesium sulphate.

The familiar purification method of re-

Author's Abstract of paper read before the Meeting of the Society, in the Large Chemistry Lecture Theatre at the University of Bristol, England, on Wednesday, June 28, 1950.

crystallisation is not only wasteful unless alcohol is added, but is generally notably inefficient in achieving removal of the trace impurities present. Highly efficient methods have been devised, however, which can be applied to nutrient reagents without difficulty, great loss of material or toxic interference. The elimination of iron manganese and often copper and zinc is effected by co-precipitation with calcium phosphate at an alkaline pH. An extraction with diphenylthiocarbazone in an immiscible solvent removes the last traces of zinc copper. These methods do not remove boron or molybdenum. The former is eliminated by recrystallisation with addition of alcohol to obtain good yields. The latter is removed by co-precipitation with copper sulphide. Nutrients treated by suitable combinations of these methods can be obtained practically free of all the so far known micronutrient elements. Iron salts require special treatment that cannot be detailed here.

The seeds or stocks used to produce the culture plants naturally contain finite amounts of all the known micronutrients. These do not usually appear to be significant but the molybdenum content of beans or the copper content of rye is known to modify the response of the plants grown with these deficiencies. In the search for yet unrecognised micronutrients the composition of the seed may require consideration.

A source of contamination not due to the basic materials is provided from dust or precipitation. It has been shown that sufficient zinc for a season's growth may be provided from dust in certain instances, and the monthly accumulation of all micronutrients on clean horizontal glass slides is relatively considerable. For this reason water cultures possess another advantage over sand cultures which for practical reasons are not easily provided with efficient covers.

Effect of Micronutrient Deficiencies

In spite of the small amounts necessary lack of any of the essential micronutrients may have severe effects on growth. Lack of iron produces a characteristic chlorosis of the younger leaves and loss of chlorophyll for the formation of which it is essential. This is often followed by necrosis, stunting and scorching. Cessation of photosynthesis is one cause of death of the plant. Iron is also essential to the enzyme systems in cytochrome, catalase and peroxidase.

Manganese deficiency produces varied but frequently characteristic effects, more usually in mature foliage, but symptoms appear in the upper leaves of potato and in cotyledons of pea and bean seeds. Chlorosis also occurs but is usually distinct from that due to lack of iron.

Good Luck, Judge

D. S. Murph—"Judge" to all who knew him—retires from the NFA August 1. He has been counsel, secretary, and treasurer of the association for 16 years. Everyone in the industry joins in saying "Good Luck, Judge!"

The role of manganese is still obscure, but this element activates enzyme systems involving carbon dioxide exchange and but this element activates enzyme systems involving carbon dioxide exchange and may also function by virtue of its numerous valency states. A relationship to iron has been proposed but does not seem to be general or of unique importance.

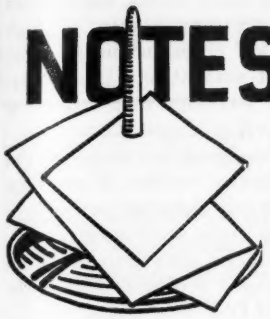
Boron deficiency is particularly serious in some crops like beet, swede, other Brassicae and tomato. Cereals are the least susceptible. Lack of boron causes malformations, death of the growing point or abnormality in other meristems and leads to disorders such as "rahn" in swede, "canker" in table beet or "crown rot" in sugar beet. Bacterial infections occur frequently as secondary phenomena.

Zinc and copper deficiencies are important to apples, pears, citrus, cereals and flax in addition to other crops. In fruit trees effects known as "little leaf" or "mottle leaf" due to zinc deficiency and "exanthema" and "summer die back" due to copper deficiency occur in many parts of the world and have recently been identified by Wallace and others in apple trees at the Royal Horticultural Society's gardens at Wisley. The leaf margins become wavy with zinc deficiency and intervenal mottling and rosetting occur. Zinc deficiency in flax causes a short top and rosetted crown with necrosis of the younger leaves and "white bud" in maize and failure to set seed in legumes. Copper deficiency in wheat and oats causes rolling of the leaves, death of the emerging leaves which are white (white tip disease) and blindness of the "ear." Copper is essential to a terminal respiratory oxidase in many plants but the role of zinc is still uncertain.

Molybdenum deficiency has only recently been identified in the field, in connection with the failure of leguminous crops in poor pastures. In these circumstances liming or additional nitrate of soda has often been effective, when the lack of molybdenum has caused failure of the leguminous root nodule organism to fix nitrogen. Molybdenum is also essential for higher plants and is required in the assimilation of nutrate nitrogen. The disorder long recognised as "Whiptail" in cauliflower and broccoli appears to be due to lack of molybdenum. These crops and Brassicae in general appear to have relatively large molybdenum needs. Cereals have much lower requirements. In addition to non-assimilation of nitrate nitrogen it is likely that water relations and hormone balance may also be upset by molybdenum defiency.

Other micronutrient deficiencies of higher plants are not yet known. Reports on the need for aluminum, silicon, chlorine and gallium need substantiation and little work has yet been reported. Recently, however, it has been shown that cobalt (present in the anti-pernicious anaemia factor and essential to prevent "pining" in sheep) is essential to the production of a growth factor by certain microorganisms (Lactobacillus and Staphylococcus) and this element may yet prove to be a plant micronutrient.

The consideration of deficiency effects is incomplete without reference to the fact that toxicity may also occur in some instances. Excess of zinc or copper readily induce iron deficiency in many plants and excess of manganese may produce characteristic toxic effects such as leaf cupping and necrosis in Brassicae or iron deficiency as in oat or soya bean. Excess of boron causes scorching of older leaves in many plants and may resemble lack of potash. Molybdenum excess may appear as blue or yellow pigmentation due to combination with anthocyanins or tannins, or in a manner resembling ammonia toxicity. Plants appear, however, to tolerate far greater concentrations of molybdenum relative to the normal level than for most other micronutrients. The effects of excess of zinc or manganese, especially with respect to iron deficiency are greatly accentuated by additional molybdenum and it may be concluded that the interrelationships and roles of these elements are complex and still far from completely understood.



NOTES FROM

ILLINOIS, NEW YORK KENTUCKY WASHINGTON MISSOURI

MISSOURI PASTURE TOUR

The Missouri Agricultural Extension Service conducted a pasture tour for fertilizer industry men recently, and they saw evidence that plenty of nitrogen in addition to phosphorus and potash is necessary for successful establishment of pastures, grasses and clovers.

Missouri Extension agronomists recommend a liberal application of phosphorus plowed under since their soils are low in phosphorus. When the pasture is seeded in late summer, they recommend about 300 pounds of complete fertilizer plus 30 pounds of nitrogen (N).

ILLINOIS FRUIT, VEGETABLE GROWERS LOSE MILLIONS

Illinois fruit and vegetable growers lose millions of dollars each year because of plant diseases, even though they apply protective chemical sprays.

So testified Dwight Powell, University of Illinois plant disease specialist, at spray residue hearings conducted by the federal food and drug administration.

Powell was one of 10 plant pathologists in the country chosen by the American Phytopathological Society to present testimony.

The hearings were held April 24–27 in order to form regulations on the lowest amounts of chemical sprays to be allowed on fruits and vegetables after they have been treated to control insects and plant diseases. No regulations are likely before the 1951 season.

Powell, with H. W. Anderson and M. B. Linn, also plant pathologists, compiled a list of 70 major plant diseases of Illinois fruits and vegetables which require chemicals to control them. Apples, peaches, tomatoes, and commercial vegetables are the main crops affected.

The three men estimate that brown rot of peaches causes an average yearly loss of 20 per cent of the crop, even where protective sprays are used. Losses may range from 5 to 95 percent.

This loss on a $5,000,000 average value peach crop would amount to $1,000,000.

Normal loss due to apple scab despite protective sprays runs about six per cent, the three men estimate, and tomato anthracnose, about five per cent. With both diseases, damage may run as high as 50 per cent.

And these are only three of 70 major fruit and vegetable diseases found in Illinois.

MINOR ELEMENT PROBLEM FAR FROM SOLVED

Soil scientists have a long road to travel before they learn the importance of minor elements in soil fertility.

Among these problem elements are magnesium, copper, zinc, calcium, iron, sulfur, and manganese, according to D. F. Allmendinger, superintendent of the Southwestern Washington Experiment station, Vancouver. Allmendinger's observations refer specifically to soils on which nut trees are grown. He says that the benefits of boron applications to walnut orchards have been clearly demonstrated because deficiency symptoms can be seen easily.

Deficiencies of the other minor elements are not so easily spied out. Soil and plant tissue analyses have not developed to the point where they alone can be used as indications of minor elements deficiencies, in Allmendinger's opinion.

He says that for most crops no normal or ideal amount of the minor elements has been established for plant tissues. And even when the best possible levels for these elements have been learned the chemical tests still may not give the status of these elements in the soil.

Then to complicate the problem, scientists must consider factors such as the degree of soil acidity, method of analysis, time of year that samples are taken, and with tissue analysis, the part of the plant analyzed.

The problem is further complicated by the factor which plant scientists call "nutritive balance." This means that elements must not only be present in the soil and in the plant in the proper amounts, but they must also be present in the proper balance. For instance, there may be enough magnesium in the soil to supply normal plant growth and still plant analysis will show a low magnesium content in the leaves. This could occur in high potash soils because where there's an over-supply of potash, plants may not be able to use the magnesium that is present.

PASTURE MADE FROM GULLIED HILLSIDE

How a rugged and somewhat gullied hillside can be made into a good pasture may be seen on the Milton McCombs farm on Greenhaven Lane, in Oldham County, Ky., according to County Agent Chester L. Brown. This past spring, work was started to build it up and get it into good grass. First, some of the gullies were filled, then two tons of lime per acre and 400 pounds of 20 per cent superphosphate spread. In addition to this, 200 pounds of a 2–12–6 ferti-

NOTES . . .

lizer were applied. Then the ground was disked on the contour. A liberal mixture of orchard grass, fescue, Korean lespedeza, red clover and alfalfa was seeded in March. At the same time, the field was nearly covered with orchard grass straw.

Along with this mixture, approximately one bushel of oats was sown per acre to prevent the land from eroding. All seed was sown on the contour.

The McCombs now have a promising stand of grass, the hillside is protected, and, in addition, some income will be realized from these acres through pasture.

PLANES SPRAY 1500 ACRES

Airplane spraying of pine plantations in Bergen, Hunterdon, Mercer, Morris, Somerset, Sussex and Warren counties, was carried out in New Jersey in May, Harold B. Girth of the State Department of Agriculture announced recently.

Twenty-five properties including approximately 800 acres were sprayed to combat the pine sawfly, the larvae of which were emerging at that time to feed on pine needles.

Later about 700 acres of state parks, forests and institutions was sprayed for cankerworm control.

Girth directed the project for tree owners who contracted at their own expense for the service. The department provided maps and aerial photographs to assist the pilots. The evergreens on each property were checked to see that uniform coverage with the insecticide was obtained.

Girth reports that the spraying program, now in its fourth year, has been successful in controlling the sawfly, considered one of New Jersey's most important forest pests.

Red and Scotch pines in state parks and forests, watershed properties and rural areas which once appeared doomed from sawfly defoliation, have now been restored to a healthy state.

In order that residents may not become alarmed in future operations as the planes maneuver approximately 50 feet above ground, the State Department of Agriculture describes them as two-passenger, twin-motor planes, painted yellow.

The planes operate from Alexandria Field, Pittstown; Lake Susquehanna Airport, Blairstown; Murchio Field, Paterson; and Somerset Airport in Pluckemin.

A NEW BULLETIN

What fertilizers for the rest of this year and next year?

Farmers asking that question can have the recommendations of the Agronomy Department at Ohio State University simply by requesting it from their county extension offices.

Earl Jones, extension agronomist and G. W. Volk, chairman of the Agronomy Department, have prepared a bulletin on the subject which can be had fot the asking. It's called "Ohio Fertilizer Recommendations 1950–51."

Recommendations are for field crops, permanent pastures and hay fields.

Among other things, the bulletin stresses the importance of high quality sod crops in the rotation. The right amount and kind of fertilizer is necessary to get the new seedings off to a good start.

"Legume-grass sod crops are the most effective means of renewing favorable soil structure or 'tilth,'" according to the agronomists.

The bulletin goes into detail on recommended fertilizers for all the important Ohio field crops.

PASTURES NEED RIGHT KIND OF FERTILIZER

"It takes the right kind of fertilizer to make a pasture really grow," believes Nick Warren, Beaufort County Negro farmer of Route 3, Washington, N. C.

According to C. L. Bright, Negro county agent for the State College Extension Service, Warren seeded one and a half acres of Ladino clover and tall fescue last fall. He had an excellent stand and in the spring he top-dressed part of it with 400 pounds of potato fertilizer which he had on hand.

Warren didn't get the desired results with this fertilizer, and the county agent advised him to use a pasture fertilizer. Because he could get only 400 pounds of 0–14–14, he decided to use it on half the pasture and see what the difference would be.

The fertilized portion developed a much better growth, and Warren was so well pleased with the results that he was reluctant to cut the crop of hay until his neighbors had seen it. A meeting was called and several neighboring farmers attended.

BONE MEAL TANKAGE BLOOD
SHEEP—COW—POULTRY MANURE
CASTOR POMACE NITROGENOUS
GROUND TOBACCO STEMS HOOF MEAL
ALL FERTILIZER MATERIALS
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FERTILIZER MATERIALS MARKET

NEW YORK

Surplus Sulphate of Ammonia Taken Up and Contract Buying about Completed. Organics in Better Demand for Both Fertilizer and Feed. No Changes in Superphosphate Prices. Potash Still in Good Demand.

NEW YORK, July 19, 1950

Sulphate of Ammonia

Most of the surplus material has been cleaned up and offerings for nearby shipment were hard to locate. No price changes were noted but practically all buyers had covered their requirements for the coming fertilizer season.

Nitrate of Soda

No price changes were made in this material and stocks were ample at all ports.

Ammonium Nitrate

Good inquiry is reported for this material, particularly from the South, with no price changes reported. Most buyers have contracted for the coming year.

Nitrogenous Tankage

One large producer reports being sold ahead into 1951 on this material and material for quick shipment is hard to locate. Prices are about the sa meas last year.

Castor Pomace

A good-sized quantity of this material was sold at $30.50 per ton, f.o.b. production points. This was only for nearby shipment as producers were not quoting for the distant positions.

Organics

All organics showed a firm tone, due to the war news, and sales were made of most materials at advancing prices. Blood sold at $6.50 ($7.90 per unit N) and higher prices were asked. Tankage sold at $6.75 ($8.20 per unit N), f.o.b. New York, with little material offered. Cottonseed meal was strong with little material offered for quick shipment, with last sales at $72.00 per ton, f.o.b. Memphis. Soybean meal sold at $86.00 per ton in bulk, f.o.b. Decatur, Ill., for prompt shipment, with futures offered at lower prices. Linseed meal was firm at $66.00 per ton in bulk, f.o.b. eastern production points.

Fish Meal

Sales were made of menhaden fish meal for prompt shipment at $120.00 per ton, f.o.b. fish factories, and scrap was offered at a slightly lower price. The feed demand increased and a good bit of the surplus material that had accumulated was disposed of. Some imported material was still offered, however, at various Atlantic and Gulf ports.

Bone Meal

Buyers are filling their requirements of this material for the coming season at present low prices and a better demand is noted for feeding bone meal. Some imported feeding bone meal is being offered at certain Atlantic and Gulf ports.

Hoof Meal

This material was firm in price, with few offerings noted. Last sales were made on the basis of $6.25 ($7.59 per unit N) f.o.b. Chicago.

Superphosphate

Prices were continued on the same basis for the new season, the response from the buyers has been very favorable, and it is said that there is no great surplus at any point. Triple superphosphate continues in good demand and the supply hardly able to fill the demand.

Potash

A better demand was noted for this material and producers report the contracting about completed for the coming season. From time to time, some imported material is offered, including some French potash.

Garbage Tankage

Producers are pretty well contracted for this material, with no price changes noted and demand good.

PHILADELPHIA

Organics in Better Demand at Increased Prices. Satisfactory Contract Business Reported for Fertilizer Chemicals

PHILADELPHIA, July 19, 1950

More interest is presently shown in organics and blood and tankage are receiving more notice from buyers. While there is not much activity in the general market, shipments are moving regularly against contracts for solid nitrogen, superphosphate and potash. Castor pomace is in freer supply and foreign offerings of fish meal are numerous.

Sulphate of Ammonia.—Market is reported firm and supplies not too plentiful. Production of synthetic is said to be cut back, with the situation in this grade tight. The recent reduction of coke-oven prices has had an unfavorable price reaction on the synthetic grade.

Nitrate of Ammonia.—This continues in rather tight supply position, with recent production high.

Nitrate of Soda.—The market is quiet and movement is on the usual seasonal basis.

Blood, Tankage, Bone.—Considerably more interest is being shown in organics and blood and tankage prices have recovered somewhat from recent low levels. Sales have been made at $6.75 to $7.00 per unit of ammonia ($8.20 to $8.51 per unit N), as against previous prices as much as one dollar per unit lower. Bone meal continues quiet with quotation strictly nominal at $60.00 per ton. Hoof meal draws no interest at $6.00 to $6.25 per unit of ammonia ($7.29 to

$7.59 per unit N). Nitrogenous tankage is reported contracted well into next year.

Castor Pomace.— Offerings are freer but little or no buying interest.

Fish Scrap.—Slightly increased feed demand adds a little firmer tone to the market, but supplies are ample. Domestic quotations remain nominal at $130.00 per ton for 60% menhaden meal, against foreign offerings at $110.00 to $120.00 for future arrival. Scrap is marked at $122.50.

Phosphate Rock.—Shipments are chiefly against contracts, with fair export demand and sufficient stocks to take care of all present requirements.

Superphosphate. — Contracts for the new fertilizer year are being renewed at no change in prices and shipments are moving without interruption. No shortage of stocks is reported.

Potash.—Capacity production of domestic is reported and shipments are moving in large volume against contracts. Interest in foreign goods is not too keen.

CHARLESTON

No Great Activity in Market. Prices Steady on Most Materials. Some Increases in Organics

CHARLESTON, July 17, 1950

No unusual activity is noted in the market for fertilizer ingredients but manufacturers are steadily contracting for the supplies they expect to use during the coming season.

Organics.—Demand for organics for fall and spring shipment is good and some producers are turning down orders, due to comfortably sold position. Blood and tankage, however, recently reached the bottom and now are showing some improvement. Domestic nitrogenous tankage is not available from two producers who are sold up and withdrawn from the market. Prices are nominally $4.00 to $4.35 per unit of ammonia ($4.86 to $5.29 per unit N), f.o.b. production point in bulk. Offerings of imported nitrogenous are light.

Castor Pomace.—Sales have been made recently at $30.50 per ton in bags, f.o.b. Northeastern production points, for shipment through September, and suppliers are comfortably sold with some orders being turned down.

Dried Ground Blood.—Chicago market is approximately $7.50 per unit of ammonia ($9.12 per unit N), in bulk, and the New York market is about the same.

Potash.—Production is heavy and demand for contracts for the new season slightly in excess of expected production, maintaining the market in a tight position.

Ground Cotton Bur Ash.—One of the major producers is withdrawn from the market, due to comfortable sales position because of reduced cotton production as compared with last season. Price continues nominally at 65 cents per unit of K_2O in bulk, f.o.b. Texas production point.

Phosphate Rock.—Supply position is comfortable and the market remains steady.

Superphosphate.—Prices continue steady with seasonal demand being adequately supplied. Buyers are contracting for their new season's needs.

Sulphate of Ammonia.—Market position continues firm with supplies generally tight. Some synthetic production has been sold through October.

Ammonium Nitrate.—Demand continues steady and prices firm.

Nitrate of Soda.—Demand is seasonal and supplies entirely adequate. Prices continue unchanged.

CHICAGO, July 17, 1950

In line with all other commodity markets, animal ammoniate prices advanced sharply over the past two weeks. The market is in a strong position with a broad demand for all products and, as might be expected, offerings are extremely light, with further advances sought following each newly established price.

Meat scraps, 50% protein, ground and sacked, are strong at $120.00 to $125.00 per ton. Digester tankage, 60% protein, is listed at $115.00 to $120.00 per ton, but in both cases reports prevail that at some points prices of $5.00 to $10.00 per ton higher were paid. Dry rendered tankage is moving in a limited way with prices ranging from $2.15 to $2.25 per unit of protein and in some instances asking prices are as high as $2.50 per unit. Wet rendered tankage is generally quoted at $8.75 to $9.00 per unit of ammonia ($10.63 to $10.94 per unit N) and dried blood at $8.00 to $8.25 ($9.72 to $10.02 per unit N). Steamed bone meal, 65% B. P. L., is listed at $70.00 to $75.00 per ton and raw bone meal, 4½% ammonia, 45% B. P. L., at $65.00 to $70.00 per ton.

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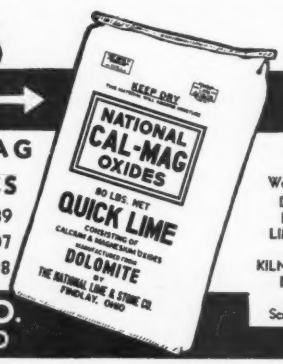

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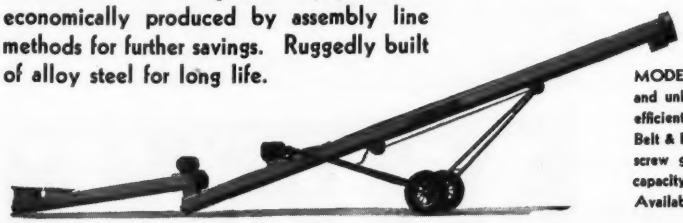

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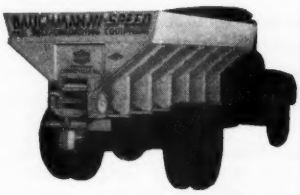

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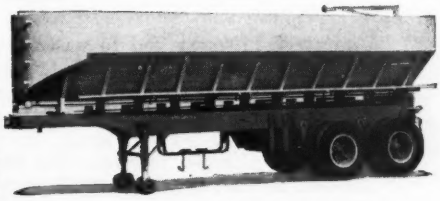

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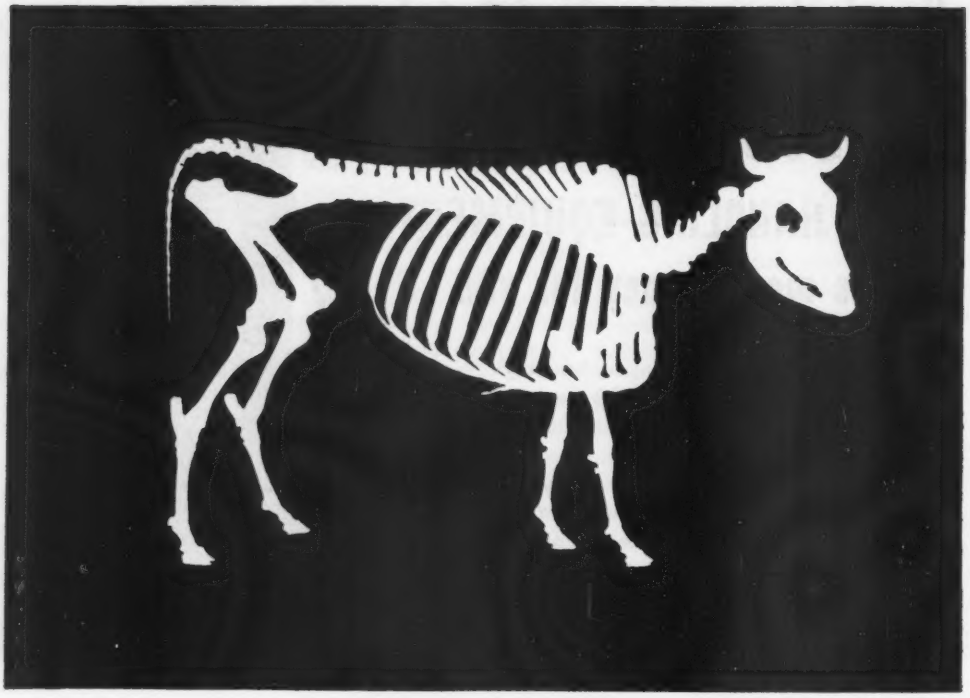

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Insecticides . . .

(Continued from page 8)

DDT is toxic to honey bees. The reason for greater seed production is that the DDT killed Lygus bugs, sucking insects that sap the vitality from alfalfa plants and lower seed production accordingly. By putting on the dust before blooms appear, the Lygus bugs are killed off, while honey bees escape poisoning since no bees are likely to be present at that time.

The hazard to honey bees in the general use of DDT evidently depends on the crop involved and the time of application. Where an alfalfa field in Utah was dusted while in bloom with three per cent DDT, 28 per cent of the field force was killed in colonies of bees located just outside the field, according to observations of Frank E. Todd and associates. The insecticide was applied with a power duster at a time when no field bees were at work.

A repellent effect on the bees was evident in the case of the DDT dusted area. While many bees were actually killed by the insecticide, the visitation of bloom by unaffected field workers was depressed, cutting down on further mortality.

Effect on Other Insects

When DDT was first used experimentally in the Pacific Northwest, it was soon learned that its use in apple orchards led to an increase in woolly apple aphids and orchard mites. Increase in woolly aphids likely is due to killing off the parasite Aphelinus, introduced into Washington in 1931 by Messrs. Newcomer and Yothers, Bureau of Entomology and Plant Quarantine laboratory, Yakima, and by LeRoy Childs, Oregon Experiment Station at Hood River, in 1928. Following the introduction of Aphelinus, the woolly apple aphid was rarely seen for nearly 20 years. With a DDT program this insect is back where it was before the parasites were introduced.

Orchard mites have become more of a problem on tree fruits where DDT has been used. Whether this is due to any effect on natural enemies, or simply to a failure to kill mites, is not clear. One of the most efficient natural enemies of the Pacific mite, the tiny black lady bettle, Stethorus, easily succumbs to applications of DDT.

In Nova Scotia in 1944, DDT sprayed apple trees showed almost complete reduction in numbers of a predacious mite, said to be the most efficient predator of the European red mite in that province, according to F. T. Lord, Dominion Entomological Laboratory, Annapolis Royal.

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If savings are discouraged or prevented, there can be only one result—government ownership, in the form of socialism or communism.

—James T. Adams.

If all the automobiles in America would be placed end to end, it would be Sunday afternoon.

Resistance to DDT

Failure of residual deposits of DDT to control houseflies was first noticed in 1947, according to Dr. E. F. Knipling, Bureau of Entomology and Plant Quarantine. Most of the failures were encountered in places where DDT had been applied for two or three years previous.

Following the widespread use of DDT by the armed forces overseas to control flies and mosquitos, statewide campaigns were conducted to kill houseflies. After two or three years, however, the quantity of insecticide that was quite sufficient the first year, failed to produce similar results. It became evident that all the houseflies were not killed in some of the early applications, and that resistant strains of the insects had developed, much more difficult to kill with DDT.

Experiments conducted at Orlando, Florida, where DDT was first studied in the United States, showed that after thirty-six generations, DDT-treated flies required twice the amount of insecticide to kill most of the insects as compared with the first generation. After forty-three generations, three times the quantity of DDT was required to kill most of the flies, as compared with that needed at first. Bred with other houseflies that have not been subjected to DDT sprays, these resistant flies in turn produce others that lose this resistance factor, according to workers in the Bureau of Entomology and Plant Quarantine laboratory at Orlando.

Early in 1948 reports of failures of DDT residual sprays to control houseflies were current in southern

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California. Similar reports came in from Idaho, where a campaign for a "fly free state" had been under way since 1947.

At first there was a tendency to lay the blame on the insecticide itself. Chemical analyses, however, indicated no significant differences in DDT content in samples of the insecticide produced over a period of three years beginning in 1946, according to work by R. L. Metcalf and Ralph D. March, California Experiment Station at Riverside.

These investigators found DDT-resistant strains of houseflies wild in the field near dairies where residual sprays had been applied for approximately three years. One of these strains was so resistant that it was practically impossible to knock down and kill 100 per cent of the flies with residual deposits of DDT.

In Virginia, Dr. W. S. Hough, who first demonstrated the resistance of the codling moth to lead arsenate sprays, is quoted as follows: "We have no scientific evidence that the codling moth has developed resistance to DDT." Similar observations have been made by W. J. O'Neill, Tree Fruit Experiment Station, Wenatchee.

In Indiana, DDT has been used in one orchard for five succeeding years, or fifteen generations of the codling moth, and there is no evi-

Mary Jane, aged 6 was looking at photos of her parents' wedding. Her father described the ceremony and tried to give the meaning. Suddenly the light dawned:

"Oh!" Mary Jane exclaimed. "Is that when you get mother to come to work for us?"

dence that the pest in this orchard requires any more DDT to control it than in previous years, according to L. F. Steiner, Bureau of Entomology and Plant Quarantine. It may be that the codling moth will in time show some resistance to DDT. In a recent issue of the "American Fruit Grower," Steiner says, "We believe that long continued usage of DDT in an orchard will eventually lead to the development of strains of codling moth that can tolerate larger amounts of DDT than needed at present for control."

Residues on Sprayed Crops

In 1945, the Food and Drug Administration established a tolerance on DDT of .05 grain per pound. This is usually expressed as seven parts per million. Washington apple growers have had no difficulty in meeting this tolerance when applications of DDT for codling moth control are restricted to the first brood, even without washing.

Late applications of DDT, applied a week or so before harvest, are impossible to clean to a point below the federal tolerance. Ordinarily, however, applications late in the season are unnecessary, unless those put on earlier have been faulty due to poor timing or adverse weather conditions.

It has been particularly difficult to remove DDT from the surface of apples with the solvents ordinarily used to remove spray residue. When the residues at harvest exceed 10 parts per million, it is ordinarily

(*Continued on page 20*)

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impossible to remove DDT to a point below the tolerance, according to Kenneth C. Walker, Assistant Chemist, Tree Fruit Experiment Station, Wenatchee.

Loss of the insecticide due to weathering does not seem to be much of a factor, at least in the irrigated regions of the Pacific Northwest where the annual rainfall is less than 10 inches, very little of which takes place during the summer months. Increase in size of fruits during the growing season makes it possible to meet a tolerance of seven parts per million, since early applications of DDT ordinarily may be depended upon to control most insects affecting tree fruits.

The appearance of the oriental fruit moth in the lower Yakima Valley has brought about the need for spraying with DDT to check that insect on soft fruits, especially in peach orchards. Early applications present no residue complications. Because of increase in size of fruits, 30 parts per million on small peaches would amount to much less than seven parts on the ripened crop.

It was not until the fall of 1948 that larvae of the the oriental fruit moth were found commonly in a limited area in the lower Yakima Valley. Present indications, based on one year's experience, indicate that the insect may be held in check on soft fruits by the use of early applications of DDT. Whether this may be accomplished year in and year out, remains to be seen.

No residue problem is involved when dry peas or peas grown for processing are sprayed or dusted with DDT. However, there is a hazard to human health when pea forage is fed to dairy cattle, because of the danger of the accumulation of the insecticide in milk. The same thing is true of alfalfa treated with the insecticide to control Lygus bugs or other insects.

Butter made from milk, the source of which was seven dairy cows that had been fed on alfalfa hay previously sprayed with DDT, was found to contain 65 parts per million of DDT, according to investigations reported by Smith, Hoskins, and Fullmer in California. The animals were fed for approximately three months. The DDT residue on the hay amounted to seven or eight p.p.m. during the feeding. After the first few days, the DDT content of the milk remained steady at about 2.3 to 3.0 p.p.m. Milk production was not affected, nor were there any apparent ill effects on the animals concerned.

Fred: "Is she making him a good wife?"

Ned—"Not exactly, but she's making him a good husband."

Several days after his father died little Johnny was stopped on the street by a neighbor.

"And what were your poor father's last words?" asked the neighbor.

"He didn't have any," Johnny replied. "Mamma was with him to the end."

Data of this kind support the attitude among entomologists that DDT should not be used as an insecticide where alfalfa or pea forage may be fed to dairy cattle.

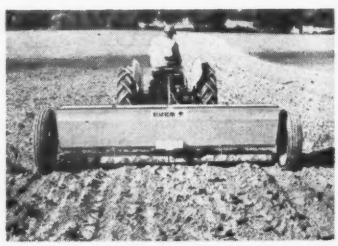
Accumulation of DDT in Soil

At first it was assumed that DDT would break down fairly quickly in orchard soils already containing four or five tons of lead arsenate per acre after years of spraying. This notion likely was due to the fact that little DDT remains on apples at harvest, following application earlier in the season to control the codling moth.

At the present recommended concentrations, approximately forty pounds of DDT (actual) are being added per acre annually to orchard soils in the irrigated regions of the Pacific Northwest. This estimate likely is too high. It assumes the necessity of three cover sprays for the codling moth. Many growers have found that adequate control may be obtained with two applications.

If DDT does not break down in orchard soils, continued applications over a period of years will aggravate a condition already serious because of the quantity of arsenic now present in these soils. That it persists in the soil is indicated by work of M. C. Lane, Bureau of Entomology and Plant Quarantine, who found that DDT will kill wireworms in soil even after five years, following applications at the rate of 10 pounds (actual) per acre. While 10 pounds per acre does not appear injurious to plant life, the application of that much or more over a period of years may be quite a different story.

Soil samples in California citrus groves, where 75 pounds of DDT per acre have been applied for two years, indicate a residue in the top three inches amounting to 45 parts per million.



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Total tonnage for the fiscal year ended June 30, 1950 was 9,966,000 or 1½ per cent less than that of the previous fiscal year. This drop reflected a decrease of about 2 per cent in the South which was partially offset by a 1 per cent increase in the Midwest.

FERTILIZER TAX TAG SALES AND REPORTED SHIPMENTS
(In Equivalent Short Tons)
Compiled by The National Fertili er Association

	June		*Calendar Year Cumulative January–June*		*Fiscal Year Cumulative July–June*	
State	*1950*	*1949*	*1950*	*1949*	*1949–50*	*1948–49*
Virginia	26,770	16,943	511,782	493,987	700,210	684,893
North Carolina	159,240	5,594	1,430,836	1,260,886	1,621,588	1,724,824
South Carolina	12,398	18,910	705,615	762,572	905,759	998,512
Georgia	15,818	28,008	956,305	1,016,422	1,173,518	1,276,385
Florida	54,569	63,008	570,148	515,463	1,038,777	863,637
Alabama	71,006	74,610	824,295	876,852	989,812	1,062,216
Tennessee	61,345	64,664	372,738	360,732	473,781	502,304
Arkansas	29,508	35,457	290,130	267,177	357,548	355,585
Louisiana	10,926	14,242	204,481	185,145	260,925	254,566
Texas	24,116	18,151	331,530	289,848	547,179	499,154
Total South	465,696	339,587	6,197,860	6,029,084	8,069,097	8,223,076
Indiana	28,470	27,092	465,489	365,320	870,908	872,395
Kentucky	10,310	7,876	399,407	324,669	565,454	535,998
Missouri	282	426	292,715	286,407	460,699	472,163
Total Midwest	39,062	35,394	1,157,611	976,396	1,897,061	1,880,556
Grand Total	504,758	374,981	7,355,471	7,005,480	9,966,158	10,103,632

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A pictorial report on the menhaden industry is now in the making. The menhaden fishery—largest fishery in the United States—is the subject of a United States Fish and Wildlife Service film now in production.

The new 16mm. sound and color film is a cooperative project of the menhaden industry and the Fish and Wildlife Service's commercial fisheries branch. The menhaden industry is financing the film, and the branch is directing its production and will be responsible for distribution of prints.

The picture will tell the story of menhaden—from the catching of the tremendous schools of small herring-like fish to the processing and utilization of the fish-meal and oil products in agriculture and industry.

EXPERIMENT STATIONS RESTAFFING

A gradual restaffing of the agricultural experiment stations with scientific personnel which was not available during the war period is noted in the current report on the agricultural experiment stations, published by the Department of Agriculture.

During the war, the Office of Experiment Stations comments, "training of the type of person needed for agricultural research practically came to a standstill. Now an increasing number of young men who have been able to complete their advanced training have been employed.

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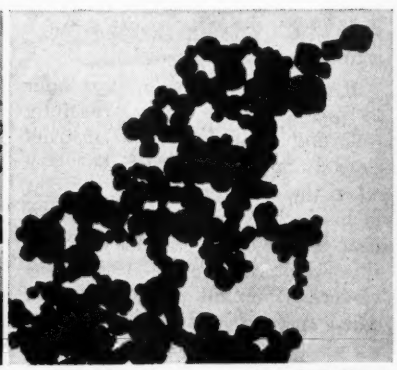

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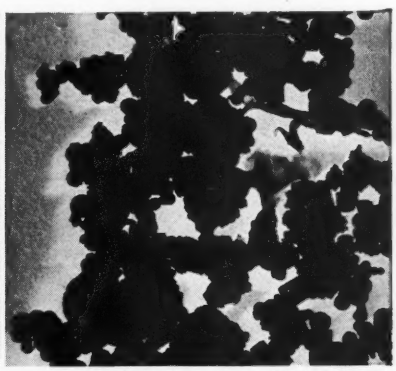

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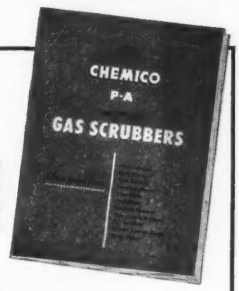

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NEW YORK WARNED ABOUT INSECTS IN '50

New York State vegetable growers may expect heavy insect infestations on their crops this year and are warned to be on guard against these pests according to Dr. R. W. Leiby, extension entomologist, Cornell University.

"Field reports throughout the state indicate a high over-winter survival of many garden pests," said Dr. Leiby. "The scientists contribute this to our relatively mild winter."

The extension entomologist believes that among vegetable pests the Mexican bean beetle will probably be as destructive this year as it was last. He pointed out that in 1949 vegetable growers who failed to use insecticides lost as much as 50 per cent of their dry bean crops.

Another insect of concern to New York farmers is the pea weevil. Recent observations show that this insect has also survived the winter in large numbers. Clusters numbering a dozen or so insects have been discovered alive in fence post cracks over the state.

Unusually warm weather again this summer may have a further bearing on the insect outlook, said the entomologist. Last summer, for instance, the state experienced the worst aphid infection on cabbage and cauliflower in the past 10 years, due largely to an extended dry spell.

At all times in history there have been many who sought escape into "security" from self-reliance.

HERBERT HOOVER

REDUCE SMALL GRAIN WEEDS WITH SPRAYS

Heavy infestations of ragweed and wild mustard should not be tolerated in small grain fields any longer, says B. R. Churchill, farm crops research scientist at the Michigan Agricultural Experiment Station. His advice should be of interest to plant food manufacturers and their salesmen.

Chemical weed killers can eradicate both of these pests, he maintains. If there is no legume seeding in the small grain, 2,4-D at the rate of one-quarter to one-half pound acid equivalent per acre can be used. If the ester form is used, the lower rate is advised. The best time to spray the field is when grain is about six to eight inches high. This applies to both winter and spring grains. Winter grains should not be full sprayed.

Mustard and ragweed plants will have four to six leaves at this time and are very susceptible to the spray. The 2,4-D can be applied in water, using about five gallons of water an acre. Spryaing small grains with 2,4-D is very risky if a legume seeding is present.

If seedings are made, it is safer to use a dinitro spray, carefully following manufacturer's instructions. Spraying should be done when the small grain is six to eight inches high. Spraying at the proper time is important. Alfalfa tolerates this chemical better than true clovers, Churchill points out, but when sprayed at the proper time, stands of red, alsike, and white clover are not seriously hurt. Sweet clover should not be sprayed with 2,4-D or dinitro sprays unless you are willing to sacrifice the seeding.

APPLE GROWERS TEST NEW UREA SPRAY

The apple basket of the future will have a high percentage of top quality brightly-colored apples as the new urea sprays prove successful for apple growers.

The urea sprays, which contain a nitrogen fertilizer, are helping to solve the problem of uneven color and poorly-finished fruit which so often results from excessive early applications of nitrogen fertilizers such as ammonium sulphate or nitrate, Ray Klackle, extension orchardist at Purdue University, explains.

Indiana apple growers will be watching results of this year's trials with the sprays conducted in the Purdue orchards under the direction of C. L. Burkholder, assistant chief of the department of horticulture. The sprays have been successfully used by eastern growers for the past several years.

Urea sprays are also labor savers. Growers who need to control insects and fungus diseases can add urea to the pest control sprays. The first application is made in the petal-fall stage. Second and third sprays are usually applied at later ten-day intervals. Late spraying with urea is not advisable as poor fruit color may result.

The extension orchardist calls attention to the warning issued by the U. S. department of agriculture that the urea sprays, which give a total of about one pound of actual nitrogen per tree in the recommended practices, may not be enough for some large trees. These trees may need additional nitrogen fertilizer.

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FUNGICIDES: Have a place in program

Micro-fine wettable sulphurs are still the best all-around materials for apple-scab control, provided spraying is done before rain periods, says Dr. J. M. Hamilton, plant disease specialist at the Experiment Station at Geneva, N. Y.

The newer organic fungicides also have a place in the spray program, providing they are properly used," states Dr. Hamilton. "For example, sone of these materials are protective only, while others are eradicants and still others good only for the cover sprays.

"In an effort to save money on scab control and yet produce good fruit, the grower must use a variety of spray materials, must keep spray and rainfall records, and must watch closely the development of his trees with relation to growth, spray coverage, and scab infection. He must also have adequate equipment to spray his plantings within 48 hours or else he must have a duster."

Growers can save on scab control by keeping the most valuable half of the orchard protected and take a chance with the rest, suggests Dr. Hamilton.

"Many growers have made money by waiting for rains and then dusting. Phygon dust increases the margin of safety and is effective for 30 to 40 hours after rain begins. Orthox is good if wettable sulphurs are to be used in rainy weather. Puratized, Tag, and Phygon are good to apply after infection periods but give no assurance of scab control after 72 hours. Puratized and Tag cause less injury than liquid lime-sulphur and may be more effective but should not be used in case of heavy foliage infections."

Growers are urged to consult local county agents about spray combinations, particularly the use of organic fungicides with insecticides. These may increase or decrease scab control and injury and should be used with caution.

TOMATOES ARE HEAVY FEEDERS

Fertilizre experiments with tomatoes carried on over a number of years on several soil types by vegetable crops specialists at the Experiment Station at Geneva, N. Y., throw light on the nutrient requirements of this important canning crop.

Ten tons of tomatoes to the acre, or 375 bushels, not a particularly large yield for this State, require 100 pounds of nitrogen, 35 pounds of phosphoric acid, and 175 pounds of potash, according to Prof. Charles B. Sayre of the Station's Vegetable Crops Division. Although the amount of phosphorus removed by the crop is relatively small, at least four times this amount should be applied to most soil because of the rapid "fixation" of phosphorus in an unavailable form in the soil, explans Professor Sayre.

One of the best fertilizer treatments for tomatoes is to plow under a clover or alfalfa sod, he continues. This improves the soil structure and supplies nitrogen to the crop cery slowly at first and then at increasing rates as the need increases.

From 700 to 1,000 pounds of 6–12–6 or 5–10–10 fertilizer to the acre should be applied broadcast and plowed under as the land is being fitted for tomatoes, it is advised. This should be supplemented with 300 pounds of the same fertilizer applied in bands close to the row at transplanting time. Additional nitrogen may then be applied as a side-dressing at the last cultivation.

An olive green color of the foliage indicates a good nutrient balance for the tomato plant. A very deep green indicates too much nitrogen and may be corrected by side-dressing with 100 to 200 pounds of muriate of potash to the acre. Yellowish-green foliage is a sign of nitrogen deficiency and should be promptly corrected with a nitrogen side-dressing, such as 200 pounds of nitrate of soda, 100 pounds of ammonium nitrate, or 150 pounds of sulphate of ammonia.

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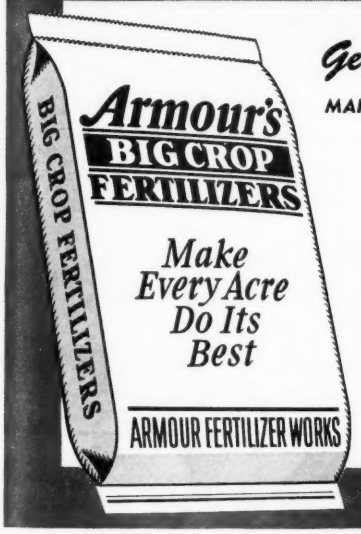

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Don't Expect A Boy To Do A Man's Job

Fruit and vegetable growers, who use the same pumps with the new concentrate sprays as they did for dilute sprays, may be expecting a boy to do a man's job, according to scientists at the Cornell University Agricultural Experiment Station.

As Prof. W. W. Gunkel, Cornell agricultural engineer, puts it, "Many of the pumps that worked with dilute sprays weren't built to take the concentrates and have needed costly repairs or replacements."

Gunkel has just finished testing more than a dozen different types of pumps. He had two aims in mind: to reduce both initial and operating costs.

Ordinarily, he explained, pumps handle about 10 to 15 pounds of chemicals to 100 gallons of water. But with the concentrate sprayers the concentration has gone up several times and the pumps have broken down.

His testing started last fall. The first thing the Cornell engineer did was to take the pumps apart and photograph and weigh each part that was likely to wear.

He didn't use any piston type pumps. They worked well with dilute sprays but were too expensive for what he wanted.

Next he gave the pumps the works. He added 24 pounds of lime and 48 pounds of sulphur to 100 gallons of water and started the pumping. This concentration is above present Cornell recommendations. But Gunkel felt the results would give him a good basis for comparing different pumps.

He ran into problems with the testing. To get field conditions, he had to change the solution every day or every other day. The rough edges of abrasives like lime were knocked off after the spray went through the pump several times.

As for the pumps, one lasted for only six hours of continuous pumping while another finished 500 hours before it stopped.

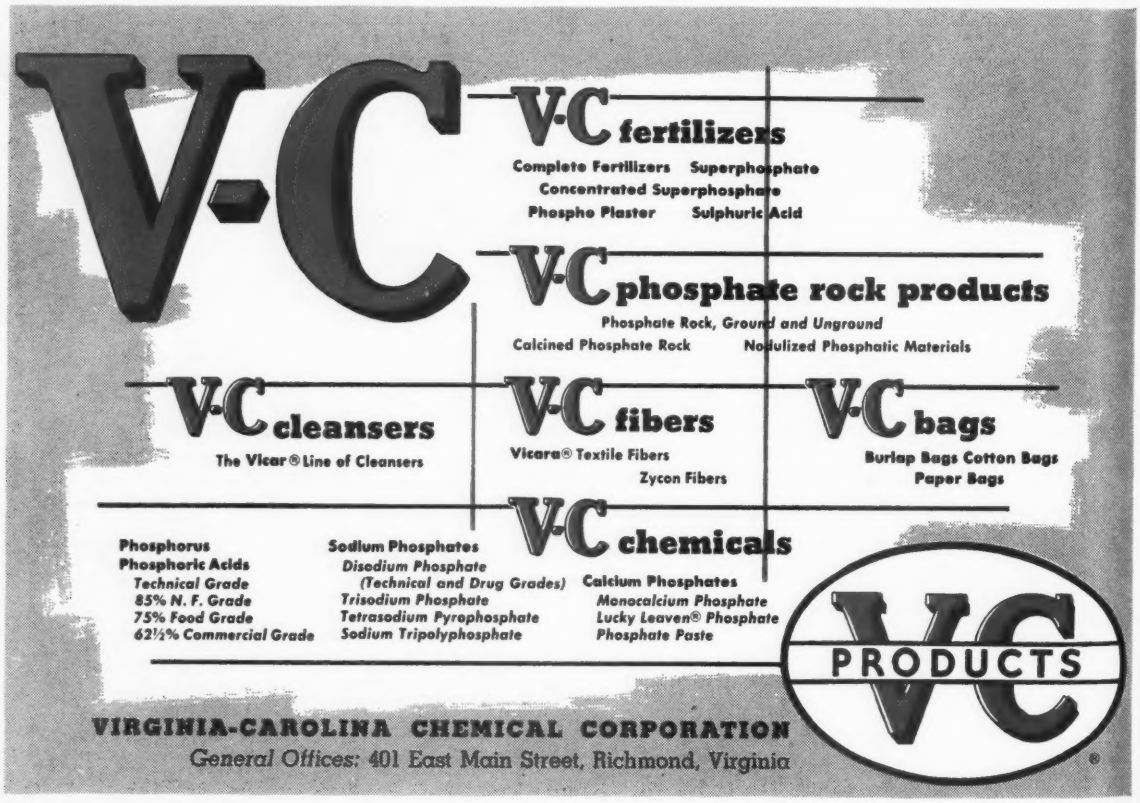
From the photographs and weighing that followed came his preliminary observation for growers and suggestions that manufacturers have already adopted.

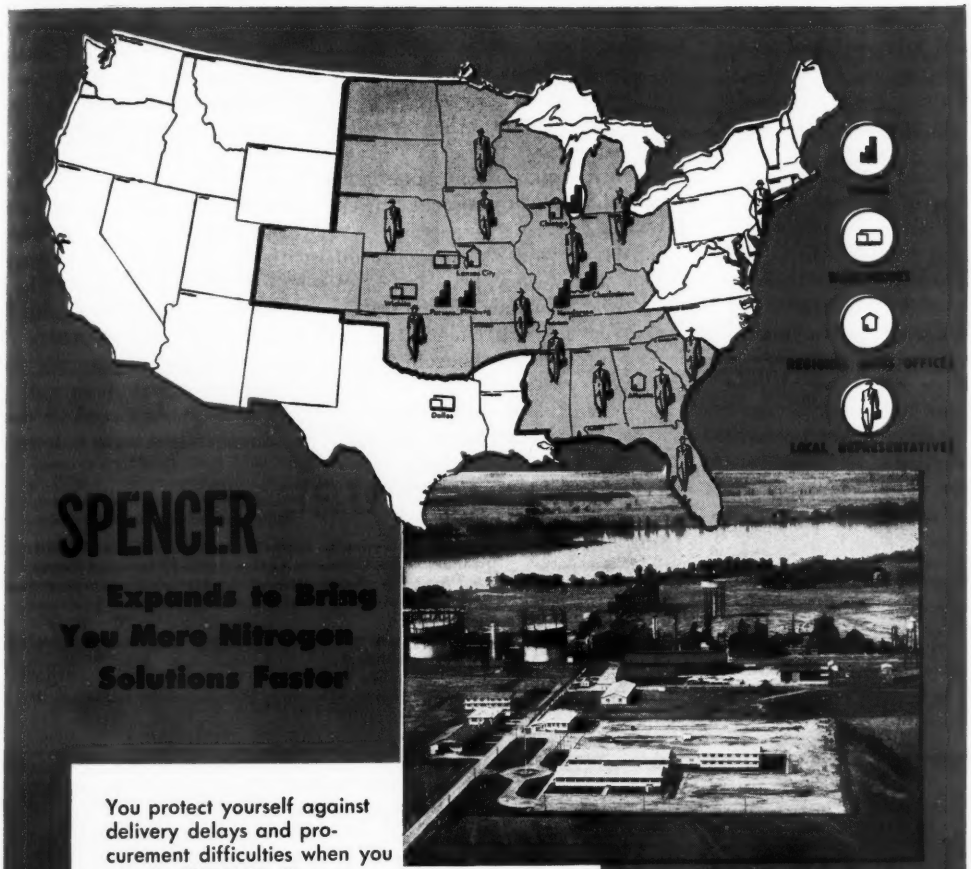
Vegetable growers aren't likely to have as much trouble with the pumps as the fruit growers, he pointed out. They use less abrasives. Lime was the worst offender and, of course, the sprays with oil bases caused little trouble.

Trouble spots he found were metal to metal contact. The abrasives act like sand paper or a file and it isn't long before the pump wears out.

Pumps with metal to rubber contact should not be left in operation unless the liquid is going

(*Continued on page 30*)





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MAN'S JOB

(*Continued from page 28*)

through it, he advised. The liquid is needed for a lubricant and without it the pump would break down in a few minutes. Some chemicals from petroleum products affect rubber parts.

Gunkel also said to look for positive seals since leakage wastes materials and reduces pressure.

He had good results with a diaphragm-type pump where there is little direct contact of parts.

The reciprocating type of pump needs a compression chamber to take the surge out and deliver steady pressure although it isn't necessary for the constant pressure type, he observed. "Concentrate sprays require close regulation on the amount of spray."

☆

It's not hard to see why women smile more than men. After all, don't men pay most of the income taxes.

It's much easier to start a conversation than it is to stop it.

WATCH OUT

Some of both the old and new spray materials are highly dangerous and one cannot be too careful in handling them. Here summarized are some cautions that might save you from tragedy:

1. Read carefully the manufacturer's directions.
2. Never spill or leave poisonous material where any animal can eat it or lick it.
3. Watch that drifting or windblown spray material does not settle where animals can eat it.
4. Wear protective clothing.
5. Keep hands away from mouth.
6. Wear rubber gloves.
7. When through, change clothes and wash hands and face thoroughly.

DO CHEMICALS POISON PASTURES?

Pastures sprayed with 2,4-D, 2,4,5-T and TCA apparently have no harmful effect on grazing livestock, according to researchers at Michigan State College. The chemicals were applied in varying dosages up to four times the normal application. None of the horses, cows, sheep, hogs, and chickens used in the tests showed any ill effects from the treated plots. Although none of the animals preferred the sprayed pasture to the unsprayed, they grazed the area treated with 2,4-D readily. In no case did the dairy cows show a drop in milk production, and no appreciable changes in animal weight were noticed.

IN THE FUTURE . . .

July	20-26	Meetings for Georgia Fertilizer Dealers and Manufacturers. Sponsored by Georgia Agricultural Extension Service in cooperation with Agricultural Units of University System
July	27-28	Fertilizer Conference, Alabama Polytechnic Insitute, Auburn, Alabama
July–Aug.	31–4	Virginia Institute of Rural Affairs, Virginia Polytechnic Institute, Blacksburg
August	6-12	National Vegetable Week
August	9	Kentucky Fertilizer Meeting, Princeton Substation, Princeton

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